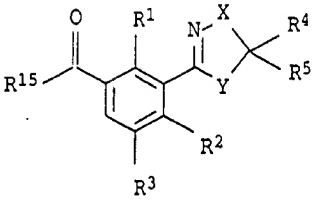
We claim

1. A 3-heterocyclyl-substituted benzoyl derivative of the formula I



I

where the variables have the following meanings:

R^1, R^2 are hydrogen, nitro, halogen, cyano, C_1-C_6-alkyl, C_1-C_6-haloalkyl, C_1-C_6-alkoxy, C_1-C_6-haloalkoxy, C_1-C_6-alkylthio, C_1-C_6-haloalkylthio, C_1-C_6-alkylsulfinyl, C_1-C_6-haloalkylsulfinyl, C_1-C_6-alkylsulfonyl or C_1-C_6-haloalkylsulfonyl;

R^3 is hydrogen, halogen or C_1-C_6-alkyl;

R^4, R^5 are hydrogen, halogen, cyano, nitro, C_1-C_4-alkyl, C_1-C_4-alkoxy-C_1-C_4-alkyl, di(C_1-C_4-alkoxy)-C_1-C_4-alkyl, di(C_1-C_4-alkyl)-amino-C_1-C_4-alkyl, [2,2-di(C_1-C_4-alkyl)-1-hydrazino]-C_1-C_4-alkyl, C_1-C_6-alkyliminooxy-C_1-C_4-alkyl, C_1-C_4-alkoxycarbonyl-C_1-C_4-alkyl, C_1-C_4-alkylthio-C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-cyanoalkyl, C_3-C_8-cycloalkyl, C_1-C_4-alkoxy, C_1-C_4-alkoxy-C_2-C_4-alkoxy, C_1-C_4-haloalkoxy, hydroxyl, C_1-C_4-alkylcarbonyloxy, C_1-C_4-alkylthio, C_1-C_4-haloalkylthio, di(C_1-C_4-alkyl)amino, COR^6, phenyl or benzyl, it being possible for the two last-mentioned substituents to be fully or partially halogenated and/or to have attached to them one to three of the following groups:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

or

R^4 and R^5 together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl;

or

R^4 and R^5 together with the corresponding carbon form a carbonyl or thiocarbonyl group;

R^6 is hydrogen, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy, C_1-C_4-alkoxy-C_2-C_4-alkoxy, C_1-C_4-haloalkoxy, C_3-C_6-alkenyloxy, C_3-C_6-alkynyloxy or NR^7R^8;

R^7 is hydrogen or C_1-C_4-alkyl;

R^8 is C_1-C_4-alkyl;

X is O, S, NR^9, CO or $CR^{10}R^{11}$;

Y is O, S, NR^{12}, CO or $CR^{13}R^{14}$;

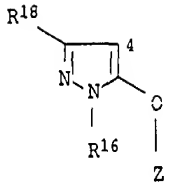
R^9, R^{12} are hydrogen or C_1-C_4-alkyl;

R^{10}, R^{11}, R^{13}, R^{14} are hydrogen, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxycarbonyl, C_1-C_4-haloalkoxycarbonyl or $CONR^7R^8$;

or

R^4 and R^9 or R^4 and R^{10} or R^5 and R^{12} or R^5 and R^{13} together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl;

R^{15} is a pyrazole of the formula II which is linked in the 4-position



II

where

R^{16} is C_1-C_6-alkyl;

Z is H or SO_2R^{17};

R^{17} is C_1-C_4-alkyl, C_1-C_4-haloalkyl, phenyl or phenyl which is partially or fully halogenated and/or has attached to it one to three of the following groups: nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^{18} is hydrogen or C_1-C_6-alkyl;

where X and Y are not simultaneously sulfur;

with the exception of
4-[2-chloro-3-(4,5-dihydroisoxazol-3-yl)-4-methylsulfonylbenzoyl]-1-ethyl-5-hydroxy-1H-pyrazole,
4-[2-chloro-3-(4,5-dihydroisoxazol-3-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole,
4-[2-chloro-3-(5-cyano-4,5-dihydroisoxazol-3-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole,
4-[2-chloro-3-(4,5-dihydrothiazol-2-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole and
4-[2-chloro-3-(thiazoline-4,5-dion-2-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole;

or an agriculturally useful salt thereof.

2. A 3-heterocyclyl-substituted benzoyl derivative of the formula I where the variables have the following meanings:

R^1, R^2 are hydrogen, nitro, halogen, cyano, C_1-C_6-alkyl, C_1-C_6-haloalkyl, C_1-C_6-alkoxy, C_1-C_6-haloalkoxy, C_1-C_6-alkylthio, C_1-C_6-haloalkylthio,

C_1-C_6-alkylsulfinyl, C_1-C_6-haloalkylsulfinyl, C_1-C_6-alkylsulfonyl or C_1-C_6-haloalkylsulfonyl;

R^3 is hydrogen, halogen or C_1-C_6-alkyl;

R^4, R^5 are hydrogen, halogen, cyano, nitro, C_1-C_4-alkyl, C_1-C_4-alkoxy-C_1-C_4-alkyl, di(C_1-C_4-alkoxy)-C_1-C_4-alkyl, di(C_1-C_4-alkyl)-amino-C_1-C_4-alkyl, [2,2-di(C_1-C_4-alkyl)-1-hydrazino]-C_1-C_4-alkyl, C_1-C_6-alkyliminooxy-C_1-C_4-alkyl, C_1-C_4-alkoxycarbonyl-C_1-C_4-alkyl, C_1-C_4-alkylthio-C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-cyanoalkyl, C_3-C_8-cycloalkyl, C_1-C_4-alkoxy, C_1-C_4-alkoxy-C_2-C_4-alkoxy, C_1-C_4-haloalkoxy, C_1-C_4-alkylthio, C_1-C_4-haloalkylthio, di(C_1-C_4-alkyl)amino, COR^6, phenyl or benzyl, it being possible for the two last-mentioned substituents to be fully or partially halogenated and/or to have attached to them one to three of the following groups: nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

or

R^4 and R^5 together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl;

or

R^4 and R^5 together with the corresponding carbon form a carbonyl or thiocarbonyl group;

R^6 is C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy, C_1-C_4-alkoxy-C_2-C_4-alkoxy, C_1-C_4-haloalkoxy, C_3-C_6-alkenyloxy, C_3-C_6-alkynyloxy or NR^7R^8;

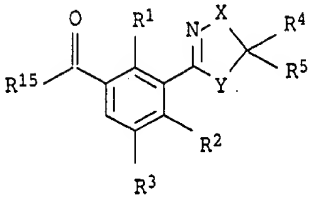
R^7 is hydrogen or C_1-C_4-alkyl;

R^8 is C_1-C_4-alkyl;

3-Heterocyclyl-substituted benzoyl derivatives

Abstract

Benzoyl derivatives of the formula I



I

where the variables have the following meanings:

R^1, R^2 are hydrogen, nitro, halogen, cyano, alkyl, haloalkyl, alkoxy, haloalkoxy, alkylthio, haloalkylthio, alkylsulfinyl, haloalkylsulfinyl, alkylsulfonyl or C_1-C_6-haloalkylsulfonyl;

R^3 is hydrogen, halogen or alkyl;

R^4, R^5 are hydrogen, halogen, cyano, nitro, alkyl, alkoxy, alkylthio, dialkylamino, phenyl or carbonyl, it being possible for the 6 last-mentioned radicals to be substituted;

X is O, S, NR^9, CO or $CR^{10}R^{11}$;

Y is O, S, NR^{12}, CO or $CR^{13}R^{14}$;

R^{15} is pyrazole which is unsubstituted or substituted, linked in the 4-position and has attached to it in the 5-position a hydroxyl or sulfonyloxy radical;

and the agriculturally useful salts thereof; processes and intermediates for the preparation of the 3-heterocyclyl-substituted benzoyl derivatives; compositions comprising them; and the use of these derivatives or compositions comprising them for controlling undesirable plants.

where X and Y are not simultaneously oxygen or sulfur;

with the exception of
4-[2-chloro-3-(4,5-dihydroisoxazol-3-yl)-4-methylsulfonylbenzoyl]-1-ethyl-5-hydroxy-1H-pyrazole,
4-[2-chloro-3-(4,5-dihydroisoxazol-3-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole,
4-[2-chloro-3-(5-cyano-4,5-dihydroisoxazol-3-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole,
4-[2-chloro-3-(4,5-dihydrothiazol-2-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole and
4-[2-chloro-3-(thiazoline-4,5-dion-2-yl)-4-methylsulfonylbenzoyl]-1,3-dimethyl-5-hydroxy-1H-pyrazole;

or an agriculturally useful salt thereof.

3. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in claim 1 or 2, where R^3 is hydrogen.

4. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 3, where

R^1, R^2 are nitro, halogen, cyano, C_1-C_6-alkyl, C_1-C_6-haloalkyl, C_1-C_6-alkoxy, C_1-C_6-haloalkoxy, C_1-C_6-alkylthio, C_1-C_6-haloalkylthio, C_1-C_6-alkylsulfinyl, C_1-C_6-haloalkylsulfinyl, C_1-C_6-alkylsulfonyl or C_1-C_6-haloalkylsulfonyl.

5. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4, where Z is SO_2R^{17}.

6. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4, where Z is hydrogen.

7. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6, where X is oxygen and Y is $CR^{13}R^{14}$.

8. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6 or 7, where

R^4 is halogen, nitro, C_1-C_4-alkyl, C_1-C_4-alkoxy-C_1-C_4-alkyl, C_1-C_4-alkoxycarbonyl-C_1-C_4-alkyl, C_1-C_4-alkylthio-C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-cyanoalkyl, C_3-C_8-cycloalkyl, C_1-C_4-alkoxy, C_1-C_4-alkoxy-C_2-C_4-alkoxy, C_1-C_4-haloalkoxy, C_1-C_4-alkylthio, C_1-C_4-haloalkylthio, di(C_1-C_4-alkyl)amino, COR^6, phenyl or benzyl, it being possible for the two last-mentioned substituents to be partially or fully halogenated and/or to have attached to them one to three of the following groups: nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^5 is hydrogen or C_1-C_4-alkyl;

or

R^4 and R^5 together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl;

or

R^5 and R^{13} together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl.

9. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6 to 8, where

R^4 is C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxycarbonyl or $CONR^7R^8$;

R^5 is hydrogen or C_1-C_4-alkyl;

or

R^4 and R^5 together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl;

or

R^5 and R^{13} together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl.

10. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6 or 7, where R^4 and R^5 are hydrogen.

11. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6 or 7 or 10, where R^{18} is hydrogen.

12. 4-[2-Chloro-3-(4,5-dihydroisoxazol-3-yl)-4-methylsulfonyl-benzoyl]-1-methyl-5-hydroxy-1H-pyrazole.

13. An agriculturally useful salt of 4-[2-chloro-3-(4,5-dihydroisoxazol-3-yl)-4-methylsulfonylbenzoyl]-1-methyl-5-hydroxy-1H-pyrazole.

14. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6, where

X is S, NR^9, CO or $CR^{10}R^{11}$;

or

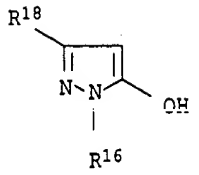
Y is O, S, NR^{12} or CO.

15. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6 or 14, where R^{18} is hydrogen.

16. A 3-heterocyclyl-substituted benzoyl derivative of the formula I as claimed in any of claims 1 to 4 or 6 or 14, where

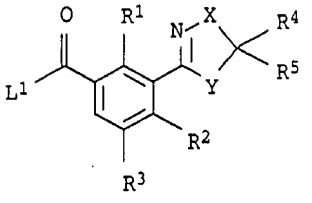
R^4		is halogen, cyano, nitro, C_1-C_4-alkyl, C_1-C_4-alkoxy-C_1-C_4-alkyl, C_1-C_4-alkoxycarbonyl-C_1-C_4-alkyl, C_1-C_4-alkylthio-C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-cyanoalkyl, C_3-C_8-cycloalkyl, C_1-C_4-alkoxy, C_1-C_4-alkoxy-C_2-C_4-alkoxy, C_1-C_4-haloalkoxy, C_1-C_4-alkylthio, C_1-C_4-haloalkylthio, di(C_1-C_4-alkyl)amino, COR^6, phenyl or benzyl, it being possible for the two last-mentioned substituents to be partially or fully halogenated and/or to have attached to them one to three of the following groups: nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;
R^5		is hydrogen or C_1-C_4-alkyl;
or		
R^4 and R^5		together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl;
or		
R^4 and R^9		or R^4 and R^{10} or R^5 and R^{12} or R^5 and R^{13} together form a C_2-C_6-alkanediyl chain which can be mono- to tetrasubstituted by C_1-C_4-alkyl and/or which can be interrupted by oxygen or by a nitrogen which is unsubstituted or substituted by C_1-C_4-alkyl;
R^{18}		is C_1-C_6-alkyl.

17. A process for the preparation of 3-heterocyclyl-substituted benzoyl derivatives of the formula I as claimed in claim 1, which comprises acylating the pyrazole of the formula II where Z = H, where the variables R^{16} and R^{18} have the meanings given under claim 1,

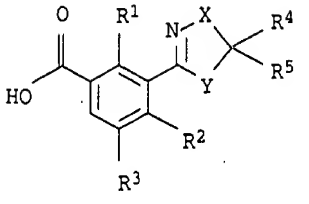


II (where Z = H)

with an activated carboxylic acid IIIα or with a carboxylic acid IIIβ,



IIIα



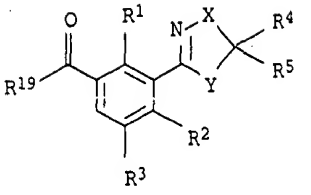
IIIβ

where the variables R^1 to R^5, X and Y have the meanings given under claim 1 and L^1 is a nucleophilically displaceable leaving group, subjecting the acylation product to a rearrangement reaction in the presence or absence of a catalyst to give the compounds I (where Z = H) and, if desired, to prepare 3-heterocyclyl-substituted benzoyl derivatives of the formula I where Z = SO_2R^{17}, reacting the product with a compound of the formula V,

$$L^2 — SO_2R^{17} \qquad V$$

where R^{17} has the meaning given under claim 1 and L^2 is a nucleophilically displaceable leaving group.

18. A 3-heterocyclyl-substituted benzoic acid derivative of the formula III,



III

where R^{19} is hydroxyl or a radical which can be removed by hydrolysis and variables R^1 to R^5, X and Y have the meanings given under the claims 1 to 16, with the exception of methyl 2-chloro-3-(4,5-dihydroisoxazol-3-yl)-4-methylsulfonyl-benzoate, methyl 2-chloro-3-(4,5-dihydrooxazol-2-yl)-4-methylsulfonylbenzoate and methyl 2,4-dichloro-3-(5-methylcarbonyloxy-4,5-dihydroisoxazol-3-yl)benzoate.

19. A 3-heterocyclyl-substituted benzoic acid derivative of the formula III as claimed in claim 18 where the variables R^1 to R^5, X and Y have the meanings given under claims 2 to 16.

20. A 3-heterocyclyl-substituted benzoic acid derivative of the formula III as claimed in either of claims 18 or 19, where

R^{19} is halogen, hydroxyl or C_1-C_6-alkoxy.

21. A composition comprising a herbicidally active amount of at least one 3-heterocyclyl-substituted benzoyl derivative of the formula I or of an agriculturally useful salt of I as claimed in any of claims 1 to 16, and auxiliaries conventionally used for the formulation of crop protection products.

22. A process for the preparation of a composition as claimed in claim 21, which comprises mixing a herbicidally active amount of at least one 3-heterocyclyl-substituted benzoyl derivative of the formula I or of an agriculturally useful salt of I as claimed in any of claims 1 to 16 and auxiliaries conventionally used for the formulation of crop protection products.

23. A method of controlling undesirable vegetation, which comprises allowing a herbicidally active amount of at least one 3-heterocyclyl-substituted benzoyl derivative of the

formula I or of an agriculturally useful salt of I as claimed in any of claims 1 to 16 to act on plants, their environment and/or on seeds.

24. The use of a 3-heterocyclyl-substituted benzoyl derivative of the formula I or an agriculturally useful salt thereof as claimed in any of claims 1 to 16 as herbicide.